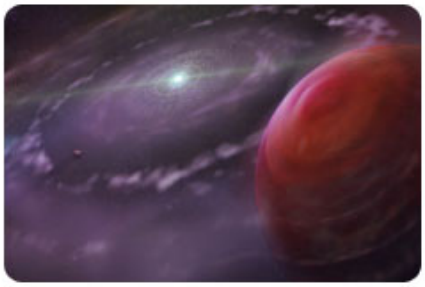
LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, March 18-22, 2013.

Los Angeles Times

A WORLD FAR, FAR AWAY



Artist's rendering of the planetary system HR 8799 at an early stage in its evolution, showing the planet HR 8799c, a disk of gas and dust, and interior planets. Image courtesy of Dunlap Institute for Astronomy & Astrophysics; Mediafarm.

A team of Canadian and Lawrence Livermore scientists have reported new observations that provide unprecedented detail about a large, gaseous planet orbiting a young, bright star called HR 8799, about 130 light years away from the sun.

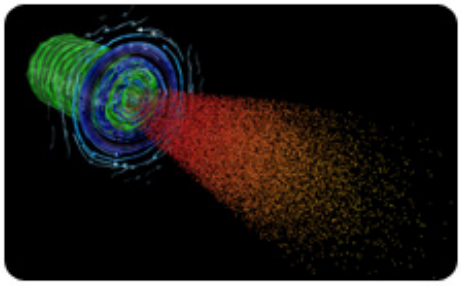
Pointing the Keck telescope toward the far-off planetary system and analyzing infrared signals, the team could see "chemical fingerprints" of the atmosphere of the giant planet HR 8799c that potentially explain how it formed.

"This is the sharpest spectrum ever obtained of an extrasolar planet," said team member Bruce Macintosh, an astronomer at Lawrence Livermore. "This shows the power of directly imaging a planetary system -- the exquisite resolution afforded by these new observations has allowed us to really begin to probe planet formation."

To read more, go to the *Los Angeles Times*.

redOrbit
YOUR UNIVERSE ONLINE

MORE CORES THAN EVER BEFORE



SIRIS simulation on Sequoia of the interaction of a fast-ignition-scale laser with a dense DT plasma. The laser field is shown in green, the blue arrows illustrate the magnetic field lines at the plasma interface and the red/yellow spheres are the laser-accelerated electrons that will heat and ignite the fuel.

Lawrence Livermore researchers have performed the largest code simulations using more cores than ever before.

The record simulations used all 1,572,864 cores of Sequoia, one of the largest supercomputers in the world. Sequoia, based on IBM BlueGene/Q architecture, is the first machine to exceed one million computational cores. It also is No. 2 on the list of the world's fastest supercomputers, operating at 16.3 petaflops (16.3 quadrillion floating point operations per second).

The simulations are the largest particle-in-cell (PIC) code simulations by number of cores ever performed. PIC simulations are used extensively in plasma physics to model the motion of the charged particles, and the electromagnetic interactions between them, that make up ionized matter.

To read more, go to Red Orbit.

The Mercury News

LIKE A FINE WINE

When it comes to winemaking in the Livermore Valley, there's plenty of brainpower behind Livermore's wineries.

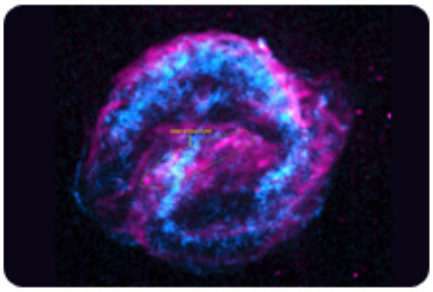
Five surprising facts about the Livermore Valley winemaking region include the fact that about half the winemakers in this region are highly educated in areas like physics and engineering. Many retirees from Lawrence Livermore or Silicon Valley companies come armed with technical backgrounds and they are off-the-charts smart.

Other little known facts about the wine region: it's old; it has its own orientation; it saved the French (Livermore sent rootstock to help them recover their vineyards after a pest wiped out their vines); and agriculture conservation is a priority.

To read more, go to *The Mercury News*.

TopNews.in
NEWS YOU CAN USE

DETERMINING THE DEATH OF A STAR



These infrared and X-ray emissions show material expelled during the death of a star. Image courtesy of NASA/CXC/NCSU/M.Burkey et al; Infrared: NASA/JPL-Caltech.

Two teams of international researchers, including two Lawrence Livermore scientists, have used the techniques of X-ray and optical observations to make the best determination of the power of a supernova explosion, long after it was noticeable from Earth.

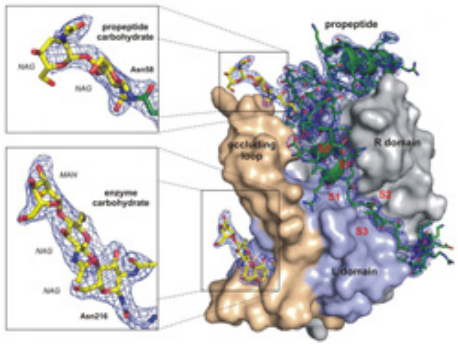
The teams say that this novel combination of X-ray and optical observations may help reveal the details of how some stars come to a cataclysmic death.

Using data from NASA's Chandra X-ray Observatory, the Gemini Observatory and ESA's XMM-Newton Observatory, researchers, including Lawrence Livermore scientists Kem Cook and Sergei Nikolaev, determined that a supernova that occurred about 400 years ago was unusually bright and energetic.

The teams used the combination of X-ray and optical images to show the aftermath of a powerful supernova explosion in the Large Magellanic Cloud (LMC), a small galaxy about 160,000 light years from Earth.

To read more, go to TopNews.

R&D PROBING INSIDE A PROTEIN



The atomic-scale structure of the enzyme tied to the single-celled parasite responsible for African sleeping sickness.

An international team of researchers, including Lawrence Livermore physicist Matthias Frank and postdoctoral researcher Mark Hunter, have, for the first time, used an ultra-intense X-ray laser to determine the previously unknown atomic-scale structure of a protein.

The team determined the structure of an enzyme key to the survival of the single-celled parasite *Trypanosoma brucei,* responsible for African sleeping sickness, a disease that kills 30,000 people each year.

This new structural information should help guide the search for drugs that act like the propeptide, tying up the enzyme and killing the parasite.

To read more, go to *R&D Magazine*.
